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Status, distribution, and movements of MARTENS in Northeastern Minnesota

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STATUS, DISTRIBUTION, AND MOVEMENTS OF MARTENS IN NORTHEASTERN MINNESOTA

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The Eastern pine marten (*Martes americana americana*) formerly was found throughout the coniferous portions of the Great Lakes Region and New England northward to the tree line in Manitoba, Ontario, and Quebec (Hall and Kelson 1959). Today, the range of that subspecies in the United States is restricted to small areas of Maine, New York, and Minnesota. The Sierra Club recently petitioned the U.S. Department of the Interior to list the Eastern pine marten as an endangered species (Anonymous 1976). The consequent need for information prompted us to review the status, distribution, and habits of this subspecies in Minnesota.

THE STUDY AREA

Data concerning the distribution of the Eastern pine marten were obtained throughout northeastern Minnesota, much of which is composed of the Superior National Forest, including the Boundary Waters Canoe Area (BWCA). Studies of movements were conducted in a portion of the Superior National Forest centered 24 km southeast of Ely in the west-central part of the larger study area (fig. 1).

Northeastern Minnesota is in the transitional zone between boreal and deciduous forests (Maycock and Curtis 1960), and 18 percent of the Superior National Forest (almost all of it within the BWCA) is still virgin (Heinselman 1973). Disturbed areas support primarily trembling aspen (*Populus tremuloides*) and white birch (*Betula papyrifera*) communities. Vegetation of virgin communities within the BWCA was studied in detail by Ohmann and Ream (1971). Geology, soil, topography, and weather of the study area

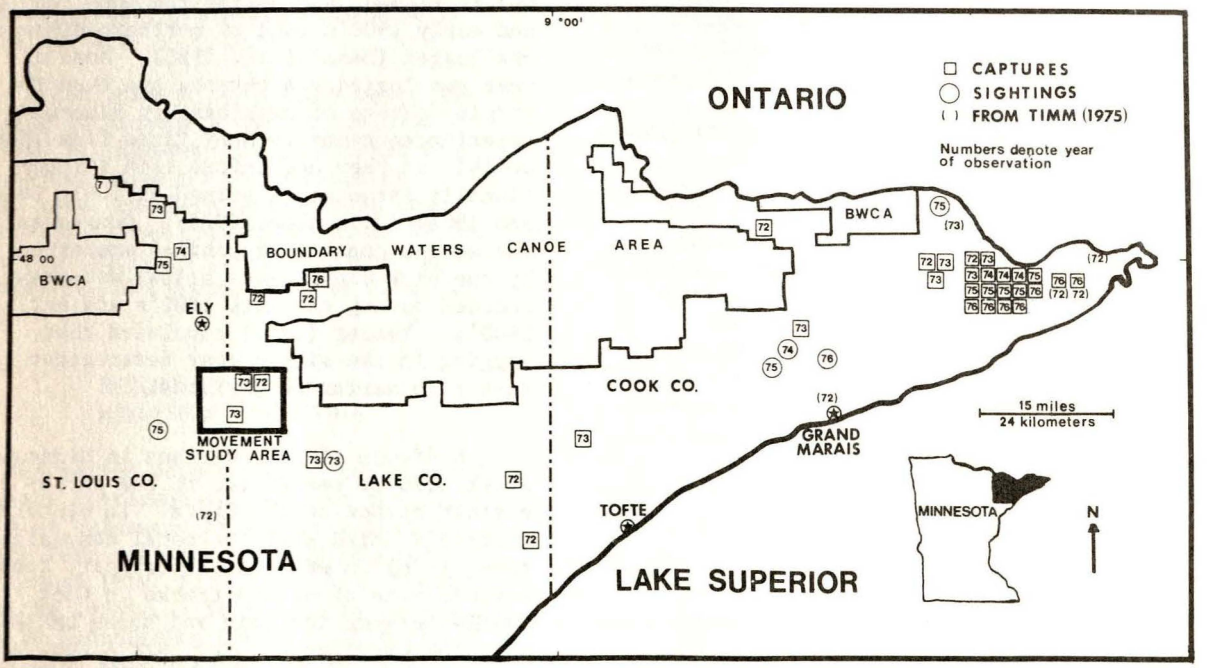

Figure 1.--*Records of Eastern pine martens in Minnesota, 1972-1976. (Not shown is a marten captured in winter 1974-75 in T70N, R23W, Section 11, near International Falls, Koochiching County, Minnesota.)*

was described by Stenlund (1955b) and Mech and Frenzel (1971). The study area is relatively flat, with elevations ranging from 184 to 701 m.

METHODS

Data on the status and distribution of martens in Minnesota were obtained from many sources. Of greatest value were confiscation records of the Minnesota Department of Natural Resources, based on martens trapped accidentally and reported to conservation officers. We also interviewed several long-time trappers, obtained fur records for adjacent Ontario from "Statistics Canada", and recorded marten observations from various field workers.

Information on marten movements was obtained by radio-tracking. Martens were accidentally live-trapped in wire box traps set for snowshoe hares (*Lepus americanus*) and fishers, (*Martes pennanti*), and one was donated by a trapper whose mink (*Mustela vison*) trap held the marten harmlessly around the neck. Two martens were captured in wolf (*Canis lupus*) traps.

Martens to be radio-tagged were first anesthetized with a combination of phencyclidine hydrochloride and promazine hydrochloride administered intramuscularly according to dosages recommended by Seal *et al.* (1970). Usually one-half concentration booster doses had to be administered to hold an animal out for 20 to 40 minutes.

Radio-collars (Mech 1974) and ear-tags were applied to the martens, and the animals were released where caught. Radio-tracking was primarily by air (Mech 1974), with some supplementary ground tracking. Hoskinson (1976) used aerial radio tracking in the same areas and found that location errors varied from 7 to 76 m. A few examinations were made of marten resting sites, with the observer "homing-in" on the animal on foot. Home-range estimates were based on the minimum area method (Mohr 1947).

HISTORY OF MARTENS IN MINNESOTA BEFORE 1970

The former abundance and eventual reduction of the pine marten in northern Minnesota are documented in the records of fur buyers. Three to 271 marten pelts were purchased each year from 1801-1808 at Henry's Post on the Red River, and approximately 1,000 pelts were purchased by a fur trader on Lake Superior in 1856 (Swanson 1940). In 1857, approximately 1,600 marten pelts were collected from 5 posts in Minnesota (Schorger 1942). The Joseph Ullmann Company purchased 43 marten skins from H. Miller of Lake Superior City (*sic*) in 1863 and bought 96 skins in Crow Wing County in 1871.

A decline in pine martens became evident in the late 1800's (Swanson 1940). The Joseph Ullmann Company purchased less than 100 marten pelts in Minnesota between 1872 and 1890. Nevertheless, martens continued to persist in a few areas. Three trappers took 43 martens from the vicinity of Caldwell Brook in Koochiching County between December 1894 and May 1895 (Swanson *et al.* 1945), and 2 trappers from Beltrami County took 22 martens in 1897 (Swanson 1940). However, even these pocket were decimated by the early 1900's (Johnson 1922, Swanson 1940, Timm 1975). The last marten recorded in Beltrami County was taken in 1918 (Schorger 1942), and the last one captured in northwestern Minnesota was taken in the Northwest Angle in 1920 (Swanson *et al.* 1945).

The decline of the pine marten occurred during the settlement of northern Minnesota. Trapping pressure undoubtedly had increased, and during the late 1800's and early 1900's much of northern Minnesota was logged (Dana *et al.* 1960). Most of what was logged was burned, and even the virgin forests of northeastern Minnesota experienced twice as many fires from 1868 to 1910 as they had before 1868 (exceptionally large areas burned in 1863, 1864, and 1894) (Heinselman 1973). Consequently, the mature coniferous habitat preferred by the pine marten (see below) was greatly reduced during the late 1800's and early 1900's. Yeager (1950) concluded that logging is the single most destructive factor to marten populations.

Evidence of pine martens in Minnesota after 1920 is restricted to the northeastern corner of the State. In winter 1928-1929, Mike West (personal communication, 1976) an experienced trapper, found several sets of marten tracks in Cook County between Mountain and Moose Lakes near the Canadian border. Art Allen, a game warden, also found tracks near Cherok Lake in Cook County in 1938 (handwritten report in files of the Minnesota Departmer

of Natural Resources). Moreover, lumberjacks of the Consolidated Paper Company accidently captured several pine martens in weasel (*Mustela* spp.) traps in the vicinity of Chester Lake in Cook County in the mid 1930's (Mike West, personal communication, 1976). The Chester Lake location had been made accessible only shortly before by a newly constructed logging road. The two other areas mentioned above were virgin conifer stands according to maps published by Heinselman (1973) and Marschner (1930).

Martens have been completely protected in Minnesota since 1933. However, the species has a low biotic potential (Marshall 1942), which may partly explain the population's low rate of increase. Nevertheless, it appears that a more important factor may have been the scarcity of preferred habitat with its associated prey species. The forests have been largely protected from fire since the early 1900's (Heinselman 1973), and fire protection generally results in an increase in shade-tolerant conifers, particularly balsam fir (*Abies balsamea*) and spruce (*Picea* spp.). Such protection from fire may have led to an improvement of marten habitat and an increase in associated prey species in northeastern Minnesota. Currently, most of the stands of aspen (*Populus* spp.) and paper birch that arose following fires in the early 1900's are being succeeded by spruce and fir.

Marten numbers apparently began increasing in Minnesota during the 1950's and 1960's. Between 1953 and 1963, four martens were trapped in northern St. Louis, Lake, and Cook Counties in the Superior National Forest (Stenlund 1955a, Gunderson 1965). A fifth specimen was captured in Lake County in 1969 (Maxham 1970).

RECORDS OF MARTENS IN MINNESOTA, 1970-1976

The marten population of northeastern Minnesota increased markedly in the early 1970's as evidenced by the fact that 50 martens were captured or sighted during that period (fig. 1): 33 in Cook County, 9 in Lake County, 5 in St. Louis County, and 1 in Koochiching County. Thirteen of the martens were observed in 1972, 12 in 1973, 5 in 1974, 10 in 1975, and 10 in the first 9 months of 1976.

We attribute the lack of marten records from the BWCA to the fact that the area is largely inaccessable during the trapping season rather than to a paucity of martens. In fact, we consider the BWCA with its dense, virgin stands of conifers as a probable reservoir for martens. Locations where marten tracks were found in 1928-29 and in 1938 (see above) were both in the BWCA, suggesting that at least some of the populations from which the recent expansion arose may exist in the BWCA.

An increase in martens similar to that in Minnesota apparently occurred in Ontario[1].

Period	*Average number per year*	*Average value per pelt*
1920-1930	4,691	$22.31
1931-1940	[2]1,425	15.64
1941-1950	1,431	28.31
1951-1960	3,670	8.58
1961-1970	17,164	6.14
1971-1975	23,882	9.28

The increase in production of marten pelts in Ontario occurred despite a drop in fur prices and despite only slight increases in the number of registered trap lines (M. Novak, personal communication, 1976). The vegetation history of Ontario adjacent to Minnesota is similar to that of Minnesota, and it seems possible that the increase in both Ontario and Minnesota were due to the same factor(s). Further evidence that similar factors affected both Ontario and Minnesota marten populations is that martens in both areas declined when the areas were logged.

RESULTS OF EXAMINATIONS OF CAPTURED MARTENS

Captured specimens included 6 males, 3 females, and 32 of undetermined sex. The carcasses of two males and a female were examined by the Bell Museum of Natural History, University of Minnesota (ECB No. 2328, 2329, and 2330). The female had light, even toothwear and a bulge in each

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[1]*From records of "Statistics Canada", Ottawa, Ontario.*

[2]*Extensive areas within Ontario's major marten range were logged in the 1920's and 1930's.*

uterine horn, indicating the presence of two blastocysts, an early stage in pregnancy (Marshall 1942). One of the males had light to moderate toothwear but appeared to be nonbreeding in November 1973 when killed. The other male's baculum was not fully developed, indicating that the animal was a young-of-the-year.

HOME RANGES AND MOVEMENTS

Three males and one female martens were radio-tracked intermittently during periods of 28 to 100 days (table 1). A total of 64 marten-days of locations were obtained. Male No. 2145 was captured three times.

All four appeared to have established home ranges. Home ranges of the males extended over 10.5, 16.6, 19.9 km^2 and that of the female, 4.3 km^2 (fig. 2). If we had recorded more locations for each animal over a longer period, they might have shown larger home ranges.

Nevertheless, these home-range sizes are larger than those found by Hawley and Newby (1957) for martens in Montana based on the capture-recapture technique. But they are smaller than the ranges found by Marshall (1951) in Idaho based on the snow-tracking of individuals.

The home ranges of male Martens 2101 and 2145 overlapped considerably (fig. 2). However, these individuals were studied during different periods (table 1), so we do not know whether they occupied their ranges simultaneously. Furthermore, the areas where each marten was found most were where the other was found least. Thus, some kind of spatio-temporal aversion could have existed between the two if they were contemporaries. Hawley and Newby (1957) noted that all of their study animals of the same sex, except for two males, had separate home ranges.

In 14 cases, consecutive daily locations were obtained for the males. On three of these occasions the marten was found in the same location on consecutive days. Excluding these days, the straight-line distance between the pairs of locations averaged 1.8 km with a range of 0 to 3.8 km.

Marten No.	*Dates*	*Distances in km*
2101	February 24-25, 1972	1.7
	25-26	2.9
	26-27	1.8
	27-28	0.0
	28-29	0.6
	March 3-4	1.5
	4-5	2.0
	April 4-5	0.4
	April 24-25	3.8
2145	February 5-6	2.8
	6-7	1.6
	March 15-16	0.0
2808	June 12-13	0.0
	13-14	0.4

These minimum daily distances our martens traveled were more than those of Hawley and Newby (1957). Marshall (1951) tracked some martens much farther in a day, but the straight-line distances between daily locations were similar to ours.

On 13 occasions, martens were located from the ground in their resting sites, which in 12 cases were in ground burrows, rock piles, or rock crevices (table 2). Once Marten No. 2101 was discovered 6 m up in a jackpine lying and sitting (much like a squirrel) quietly on a branch as the observer circled the tree below. The only other descriptions we have found of

Table 1.--*Background information about martens captured*

Marten No.	Sex	Weight: gm	Date caught	Date of last location	Total locations	Home range size km^2
2101	M	775	January 21, 1972			
2101 (recaptured)		[1]929	February 16, 1972	May 2, 1972	26	16.6
2139	F	672	December 14, 1972	January 11, 1973	10	4.3
2145	M	818	January 24, 1973			
2145 (recaptured)		680	February 12, 1973			
2145 (recaptured)		705	February 15, 1973	March 26, 1973	18	19.9
2149	M	937	February, 19, 1973	not radioed		
2808	M	1,012	February 27, 1973[2]	June 20, 1973	11	10.5

[1]Weight on February 22, 1972 after being kept in captivity since February 16, 1972.
[2]Held captive for other studies until April 20, 1973 when it was released where caught.

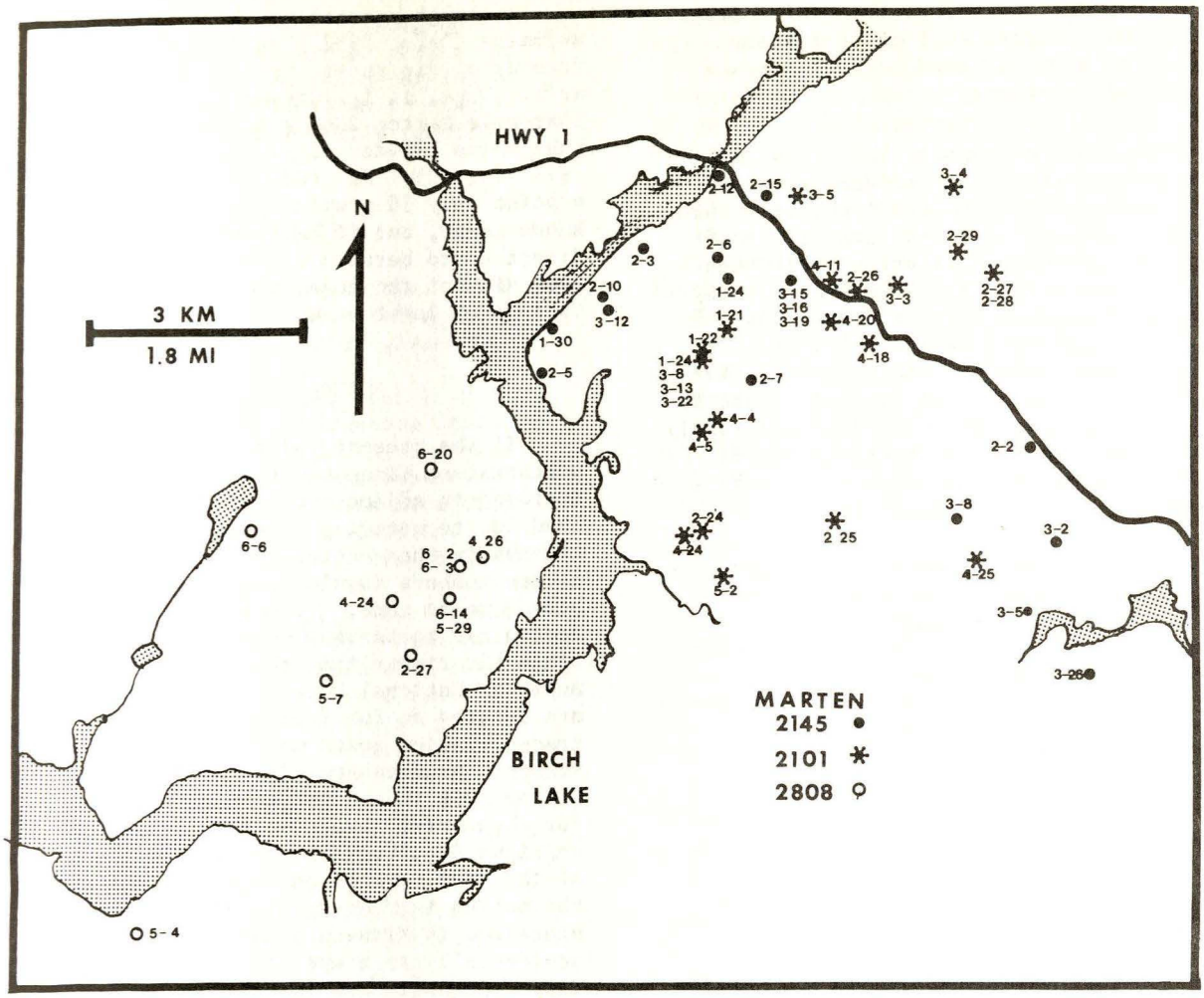

Figure 2.--*Locations of three radio-tagged martens in northeastern Minnesota (see fig. 1 and table 2). Numerals at each location represent dates.*

Table 2.--*Resting sites of radioed martens*

Marten No.	Date	Type of site	Habitat
2101	January 22, 1972	Burrow or crevice under boulder	Black spruce, birch, poplar
	January 24, 1972[1]	Burrow or crevice under boulder	Black spruce, birch, poplar
	April 4, 1972	Rock crevice	Black spruce
	April 5, 1972	Rock pile	Black spruce
	April 11, 1972	Burrow	Red pine, aspen, birch
	April 18, 1972	Burrow or crevice	Black spruce, aspen
	April 20, 1972	Burrow under log	Red pine, aspen, birch
	April 24, 1972	Burrow under rock	Jackpine, spruce, aspen
	April 25, 1972	Burrow under rock	Jackpine, aspen
	May 2, 1972	6 meters up in Jackpine	Jackpine, black spruce
2139	December 28, 1972	Burrow or crevice	Balsam
	January 5, 1973	Burrow or crevice	Open birch, aspen
	January 9, 1973	Burrow or crevice	Aspen, birch

[1]Different den but within 100 m of January 22 location.

marten resting sites were those of Marshall (1951) who reported that of 16 martens tracked to dens, 13 used hollow logs and 3 used hollow stumps.

The distributions of locations for each of the martens was uneven, with some areas being used much more frequently than others. Because aerial determination of locations is subject to error (Hoskinson 1976) we cannot say for sure that exactly the same locations were used more than once, but certainly Marten 2101, for example, made multiple visits to relatively small areas (fig. 2), as was also found by Hawley and Newby (1957) and Marshall (1951). In the case reported by Marshall (1951) a marten repeatedly returned to an elk (*Cervus elaphus*) carcass to feed.

A gross examination of cover types in the marten home ranges indicates that the animals ranged through a variety of vegetation. Generally the areas inhabited by the radioed martens were similar to much of the rest of the forest, which was logged and/or burned primarily between 1890 and 1920 (Stenlund 1955b).

Examination of the specific daytime resting sites of the radioed martens also indicates that they used a variety of forest cover types. About the only generalization that can be drawn from the data is that most of the resting sites were situated in stands of conifers, many of which included some white birch and/or aspen (table 2). A high percentage of the marten captures and sightings were also in conifer-dominated areas or mixed stands (fig. 1 and Marschner 1930).

Marshall (1942) concluded that martens are adaptable in their use of cover types. He found martens primarily in conifer stands, but apparently there were few stands of deciduous trees in his study area (Marshall 1951). In Ontario, DeVos (1952) stressed the marten's need for mature timber, disagreed that conifer cover makes the best habitat, and stated that mixed stands appear best. However, DeVos *et al.* (1959) later reported excellent evidence that areas of mature conifers produced greater numbers of martens than did interspersed areas having fewer mature conifers. Further, Koehler *et al.* (1975) studied martens in coniferous forests in Idaho and found that they preferred stands with canopy cover greater than 30 percent.

Although martens are known to be good swimmers (DeVos 1952), we have found no records of distances over which they can swim. Thus, it is interesting to note that male Marten 2808 swam across Birch Lake twice between May 7 and May 29, 1973 (fig. 2). He could have crossed at a point only 30 m wide, just east of his known range, but if he took the most direct route between his locations on each side of the lake, he would have had to swim at least 64 m.

FUTURE OUTLOOK

If the present increase in martens in northeastern Minnesota and the apparent increase in adjacent Ontario are indeed due to maturing forests and increases in shade-tolerant conifers, marten numbers should continue to rise for some time to come. It currently is uneconomical to harvest much of the aspen-birch-fir timber that abounds in the Superior National Forest because the stands are located so far from the mills that transportation costs make cutting of such stands unprofitable. If the virgin forests of the BWCA indeed serve as reservoirs for the marten, the no-cut policies that continue in effect in the Interior Zone of the BWCA further enhance the future of the marten in Minnesota. Martens are protected in Minnesota and are taken only accidentally in traps set for other species. They apparently are increasing despite this level of exploitation. However, martens are very easily trapped, and their numbers can easily be decimated by overtrapping (Yeager 1950, DeVos 1952, DeVos *et al.* 1959). Therefore, no legalized trapping is recommended. Studies should be conducted to determine the extent to which the relatively inaccessable virgin conifer stands of the BWCA actually serve as a reservoir for martens in northeastern Minnesota.

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